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ABSTRACT

This thesis reviews those articles that have been published since the early 1960s in the area of perceptual-motor and sensory-motor programs which affect reading readiness in beginning readers at the kindergarten-first grade level. The contents include: "Reading: A Definition," which looks at some of the definitions proffered by authors in the field of reading; "Perceptual-Motor or Sensory-Motor (Programs)--A Definition," which discusses several of the sensory motor skills; "A Description of 'Readiness' as It Relates to Reading," which presents the views of authorities about predictors of success in reading; "Reading Readiness Skills," which discusses some of the readiness skills; "Gross-Motor Training Programs," which presents articles and other works which are based on the use of gross-motor, perceptual-motor, or sensory-motor training programs; "Fine-Motor Training Programs," which presents articles and other works which are based on the use of fine-motor, perceptual-motor, or sensory-motor training programs; "Visual Motor/Visual Discrimination Training Programs," which presents material related to training pupils to read using visual-motor or visual-discrimination training; and "Summary of Research Implications." (WR)

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THE RESULTS OF SENSORY MOTOR OR PERCEPTUAL MOTOR PROGRAMS ON BEGINNING READING SKILLS - A REVIEW OF THE LITERATURE

A paper submitted to the FSU Department of Educational Research and Testing in partial fulfillment of the Preliminary Examination for the degree of Doctor of Philosophy.

Philip J. Grise, Jr.

June, 1973

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Introduction

A perusal of Psychological Abstracts, Education Index and Educational Resources Information Center (ERIC) shows that since approximately 1927, literally hundreds of articles have been written on the general subjects of the effect of perceptual-motor programs on reading readiness and those factors which may contribute to the success of a beginning reader. It would be a task beyond comprehension to compile, review and critique all of these articles in one paper, but more importantly, it would also be wasted effort because of the vast bulk of reading research that has been done in the past decade.

In the 1960's and 70's a predominant political theme has become the notion that each American child has the "Right to Read". With Congress considering this a Bill of prime importance, research monies became more readily available to educators who wished to probe into the aspects of reading, especially beginning and remedial reading. The availability of funds has allowed considerable research to be undertaken.

For this above reason, and the earlier mentioned reason of practicality, this paper will be limited to reviewing those articles that have been published since the early 1960's. The specific area reviewed will be perceptual-motor and sensory-motor programs which affect reading readiness in beginning readers at the kindergarten-first grade age level.

To effectively make a review of the literature, certain definitions must first be made for the purposes of this paper. Essentially we need to define the term "reading" itself and explore the concept of "readiness" as it relates to reading. In addition, we shall define "perceptual-motor" and "sensory-motor".

Reading - A Definition

Many authors have attempted to explain reading but some never bother to make a distinct definition. This reviewer found a few very good but widely divergent definitions. For individuals of normal hearing ability,

> "The process of learning to read in one's native language is the process of transfer from auditory signs for language signals, which the child has already learned, to the new visual signs for the same signals. This process of transfer is not the learning of the language code or of a new language code; it is not the learning of a new or different language signals. It is not the learning of new 'words' or of new grammatical structures, or of new meanings," (Fries, 1962, p. 120).

Fries notes that the important aspects for reading are developing a set of habitual responses to graphic shapes; learning about the left-to-right sequencing of letters and words; identifying the letters of the alphabet; intonation, and identification of graphic symbols such as numbers and punctuation marks.

Nicholas Anastasiow (1970) presented a paper in which he states that the difference between reading and oral language is reducible to two critical phases. Essentially, these consist of first, the child learning the necessity of a relationship between spoken speech and a written symbol system for speech -- graphemes; and second, the child's previous ability to comprehend and decode speech auditorily.

Anastasiow's views are similar to Resnick in the developmental model for early childhood education. Resnick feels there are essentially three classes of skills for an early learning curriculum (not necessarily just for reading) (Resnick, 1967, p. 4). They are perceptual and motor skills; conceptual and linguistic skills; orienting and attending skills - such as following

directions, paying attention, and accepting delayed rewards.

Remembering what Anastasiow has stated about essential qualities needed for learning to read, it is interesting to note the following opinions of Eleanor Gibson (1970) made in relation to methods of teaching reading.

She feels that a problem to the "whole word" teaching approach is that the student has no way to learn a new word unless he is told what it is. The child cannot analyze the components and their relationship, which she feels is necessary for transfer of learning. Not even the white spaces which separate one word from another may be enough of a cue to a kindergarten pupil to identify "what is a word" by pointing.

Gibson's viewpoint essentially is that:

> Motivation and reinforcement for cognitive learning such as speech and reading are internal. The reinforcement is not a reduction of a drive, but a reduction of uncertainty, specifically the discovery of structure that reduces the information processing and increases cognitive economy. This is perceptual learning (1970, pp. 136-143).

Edward Summers recently completed a most extensive paper offering a clear definition of "reading". He reviewed all other definitions of reading available to formulate a workable solution that Canadian English teachers could use. He found that one must begin with "a consideration of the reading process - a sequence of identifiable, observable and covert behaviors which make up the reading act" (Summers, 1970). In addition, he felt sure a clearer distinction must be made between the process of reading itself, language development as it relates to reading and the pedagogical aspects of learning to read.

His broad based review also found that the teaching of reading as a science had reached a plateau in the past three years (1967-1970); different methods of teaching reading did not produce significantly different results (Much more of this finding will be further substantiated by this author later

in the paper); there is no broadly accepted model showing the basic elements of reading and their interactions; summaries of research on reading have been done in a manner that prohibits synthesis of materials and findings, and previous attempts to concentrate emphasis on reading by funding agencies have produced proposals for research on only part of the problem with little if any hope for a cumulative resolution of the total problem.

After all his criticisms and reviews, Summers came to a concise definition of reading. The definition is as follows:

> Reading behaviors are covert responses to verbal written language. These covert responses are indicated by overt performance which could not have occurred without the covert responses to the written language (Summers, 1970).

This clearly suggests a researcher or even a teacher, must first identify those directly observable items that correlate with covert responses, then determine the dependence of the overt performance on the covert responses and finally develop valid scales for quantifying those overt performances. A case in point would be to construct a series of sentences from basic word lists that require the child to respond in a precise manner.

For example, "Johnny, push the book to the left" could be read by the child and then his behavior observed to see if "Johnny" could indeed follow the printed instructions. An overt response would be required by the child to prove whether or not he did in fact read the sentence. Whether the child pushes the book left or right or even straight ahead brings up another problem. Does the child understand the directionality concepts? At least some vaguely accurate response to the criterion statement would have been made. It would be up to the experimenter to determine the level of acceptability to deem the pupil's response correct. For instance, if after

reading the sentence the child made no motion, or tied his shoe, there would be a clear incorrect response.

Another concise definition of reading has been stated by Bormuth (1968). His definition is one of "reading comprehension", the very core and purpose for reading. He states:

> "Comprehension ability is thought to be a set of generalized knowledge - acquisition skills which permit people to acquire and exhibit information gained as a consequence of reading printed language" (p. 50).

Once again, such a definition requires the "reader" to overtly exhibit a response which may be interpreted by others as evidence of understanding the reading of a passage.

Perceptual-Motor or Sensory Motor (Programs) - A Definition

In perceptual-motor or sensory-motor skills or programs, most authors make little or no distinction between the two terms, however, most typically the term perceptual-motor is used.

Resnick (1967, p. 5) makes some distinction between the two. She considers perceptual-motor skills as those which underlie higher-order conceptual functioning. This includes such things as" "ability to use one's body efficiently with awareness to position in space, and the ability to make a wide range of sensory discriminations." This includes both gross and fine motor skills. Also included in perceptual skills are "positioning" skills such as left-right and movement in prespecified directions.

The sensory skills Resnick simply states is that range of visual, auditory and haptic (touch) perception and discrimination behaviors which she feels are virtually synonymous with the child's earliest learned concepts. Part of the trick of early childhood learning, she adds, is for the child to make organization and sense out of all the various sensory inputs that occur to an individual at once.

"Perceptual growth toward reading follows growth and development patterns." Cohen (1962) found three steps in the perceptual-motor process which he describes. They are: "1) Learning to handle self by control of body processes of coordination; 2) learning to relate to the outer world of others; and 3) learning to manipulate the world 'out there'."

Similarly, Zietz (1970) found three main stages of learning perceptual-motor skills including: "1) the physical ability to hear, see, etc., 2) understanding what something is, and 3) reaction to stimuli in a meaningful manner."

Some authors have tried to model their programs and experiments after the theories of Inhelder and Piaget. Essentially their theories are that learning is characterized by an interaction between perception and language and that learning is impaired unless there is frequent interaction between language and perception. A resulting definition of perception and concept follows from one of those authors (Scott, 1970). "Perception is an immediate interpretation on incoming sensory information. These become internalized to form concepts. Concepts are an enduring combination of related perceptual images which the individual manipulates internally without reference to the immediate environment."

At least one author has expressed concern over perceptual-motor programs in the schools as not being similar enough to reading to produce the "transfer" effect all agree upon so readily.

Pryzwansky (1969) in his dissertation reviews these concerned authors and states as his own thesis:

> "However, some concern has been voiced in the literature regarding the value of training which rests heavily on the transfer effect to reading skills. The materials usually consist of objects or geometric shapes, but not letters. If manuscript writing were approached as a visual-motor task, then intuitively, it would appear to be a more beneficial type of reproduction training."

A Description of "Readiness" as it Relates to Reading

Recently, noted reading researcher Walter MacGinitie did a complete analysis of reading readiness and cited many articles that pertain to reading readiness, what it is and how it works. He states simply that a child is in school to learn, but what and how a child is to learn are the real issues.

> The question "Is the child ready to learn to read?" is a foolish one for a child does not learn to read in an instant (MacGinitie, 1969).

Instead he clarifies that reading is a process that takes time. Further, he adds, the question "Is a child ready to begin to learn to read?" makes sense only if it has been specified how the reading program will be taught. By this he means information such as where the school will start the program and what possible sequences of learning experiences the school is willing to make available to the child.

There are two sets of factors that MacGinitie feels are clearly related to the readiness problem. First, maturational factors are important to readiness as they may hold clues to inherited differences in intelligence. But also, he feels the child's experiences up to this learning-to-read point are also a vital factor and his future experiences will depend greatly upon this and the teacher.

To better understand the nature of the process of learning to read and to learn to make helpful predictions are the natural goals of current reading research. However, MacGinitie feels strongly there is a need for even more research in reading. He would like to see research that would spell out specific skills a child can do in the reading process such as: Has a memory span of five letters; can discriminate all letters except pdqb; can segment

sounds in words that are up to four phonemes long, as long as the word contains no nasal consonant or semi-vowel; can sight read common articles and prepositions by sight and therefore predict from this that the child will make good progress on learning to discriminate visually between certain syllables and will be able to read an easy story "Q" and can learn task x easily if he learns task y. All this, of course, MacGinitie cites as a clear need for the development of a hierarchy of reading skills, such as "Criterion Reading" developed by Marie Hackett (Hackett, 1971).

"In general, findings of past reading readiness research can be quite succinctly summarized: Best predictors tend to be those tasks that are most similar to the criterion -- tasks similar to reading itself," MacGinitie adds.

He cites the need for adequate factor-analytic studies that begin to indicate the independent dimensions of the many kinds of test scores that predict success in beginning reading. Real promise, he feels, lies in predictive measures less obvious to the criterion task of reading than previously thought. These tasks include activities such as auditory-visual integration and visual-motor coordination.

One of the most frequently used programs of perceptual-motor training for reading readiness was developed by Marianne Frostig. She has addressed herself to the concept of readiness also:

> Our knowledge will not be advanced by arguing about the degree to which visual perception is related to reading. A more fruitful approach is to explore the cognitive and other abilities of an individual, and relate them to different task processes at various stages of development and performance, so that an educator can choose the optimum method to help a particular child learn a particular task (Frostig and Maslow, 1969).

The reader cannot help but see the similarity between her plea for research into reading readiness hierarchies and those comments just cited from MacGinitie. Both feel the process skills of reading (as of 1969) had yet to be defined ideally.

In a recent dissertation on the subject of auditory and visual discrimination, MacGinitie's feelings were further verified. Sarah Van Camp (1970) stated that little is known about the relationship between auditory and visual discrimination in young children and the role that this discrimination plays in beginning reading. Her study concluded that if a child was found to prefer one modality over another when tested using the International Code as a base, beginning reading should probably be presented in the child's favorite mode to insure initial success in reading. Also, that a phonetic approach may be meaningless to a child who is visually oriented; conversely, a visual approach may be meaningless to a child who prefers an auditory mode.

Dolores Durkin (1970) scorns the use of reading readiness test scores as measures of teacher-aide programs, summer programs, Frostig and Delacato programs, etc., because, she feels, implicit to all the above program evaluations is the idea that the readiness score really does tell how well or poorly a child will perform when reading instruction begins. She further questions the readiness tests.

Durkin feels the question should not be, "Is the child ready?" because this omits attention to the most important variable, which to her is, what type of reading instruction is going to be administered. The child well might be "ready" if one type of instruction is offered and not ready for another type.

A good way to think of readiness, Durkin believes is to think of a collection of readinesses, not just one gross measure. From this it follows that Durkin's readiness concept also assumes a child will not be ready to learn everything about reading at once, especially since reading is not taught this way. This she feels is where past readiness concepts have failed, they have used a gross measure to say yes or no this child has reading readiness. In the end, Durkin feels that only longitudinal studies will be able to pass final judgment on the success of any reading programs.

An example of the type of testing research Durkin is opposed to is a recent study by Norma Livo (1970). In an effort to discover what factors are crucial to reading readiness and beginning reading, she administered the Wechsler Preschool and Primary Scale of Intelligence (WPPSI), the Sartain Reading Readiness Test (SRRT) and the Oral Language Sample. The pupils were then administered the Metropolitan Readiness Test to see what test or subtests would be most effective and efficient in predicting reading success.

There were in all the three pretests a total of 26 subtests which measured such things as auditory discrimination, visual discrimination, intelligence factors and oral language maturity. In Livo's study, the aforementioned subtests accounted for 45% of the variance between themselves and the criterion reading score of the Metropolitan. To her this meant there still was an unaccounted for and untested 55% reading abilities. She felt that into this category most likely would fall such factors as self-confidence, motivation, memory span and so on.

The end result of Livo's study showed that overall, the WPPSI was not the most effective and efficient, but the SRRT was effective in predicting success in beginning reading, especially the sub-test of word memory which

both discriminated and predicted well.

A doctoral dissertation examined reading readiness the way Durkin had advocated in her article (Hirst, 1969). In a three year longitudinal study with an N of 300, massive testing was done to see what variables best predicted first and second grade reading achievement. Hirst's results indicated that among other factors, the most successful predictors were the numbers subtest of the Metropolitan Reading Readiness Test, the digit span of the Wechsler Intelligence Scale for Children, the child's sex, the education level of the mother, socio-economic status, and the kindergarten teacher's rating of the child's socioemotional growth.

A booklet primarily for parents of beginning school children considers reading readiness as both those initial lessons in reading and the pre-reading stage in which the teacher determines through analysis of the child's attitude, maturity, and prior education that lessons should begin (Rogers, 1971).

In a recent dissertation, McClintick (1971) follows the same course of thinking through reading readiness as Gibson. The purpose of McClintick's study was to develop a simplified reading alphabet for beginning and remedial readers based on the following assumptions:

1) Irregularities in English Orthography may be a major difficulty in the beginning readers learning to read.
2) Combination of upper case and lower case letters may confuse the beginner.
3) It's desirable to retain the 26 letter alphabet and spellings to simplify transitions later.
4) A more efficient model of a modified alphabet can be developed.

In his study, McClintick created the Simplified Signalling System (SSS) for new and remedial readers. He compared it to other modified systems such

as ITA, DISTAR, UNIFON, and the Diacritical Marking System in similarity of configuration and similarity of detail within a word. The conclusion of the study indicated that McClintick's own SSS appeared to work the most effectively of all systems analyzed, but a need exists for further evaluation of the system before any major conclusion can be reached.

Cazden (1971) contrasted the English Infant School reading readiness techniques with those of the Harvard Preschool project. He notes that the English Infant School program has certain skills in the cognitive domain identified for teaching beginning reading. These include planning, talking over and explaining experiences, asking increasingly penetrating questions, and engagement in dramatic play (p. 355). The children are encouraged to use language as a tool for categorization and generalization. Cazden notes that

> Vocabulary testing advocated here, on the other hand, is not testing some set of words for their representative value, but testing of particular words, which the program has decided to teach. In even the least didactic program, certain experiences are planned. For instance, if the group takes a trip to a farm in the fall and then returns to school to make applesauce and re-create the meaning of the trip in a variety of ways - discussion, dramatic play, block building, painting, clay, etc. - the teacher should at some point evaluate, by observation or test, the children's learning of words used in the experience (p. 361).

In the Harvard Preschool project, test items used look like the following:

Show me how	(a) the boy washes the girls (using dolls) (b) the boy washes himself
Point to	(a) the daddy of the boy (b) the daddy's boy
Make	(a) the boy hit one of the girls (b) the girl that the boy hit, run away

(p. 366).

Cazden explains that readiness and vocabulary tests in general are full of validity problems. He notes that

> Vocabulary tests as we have described them have two important limitations, one substantive and one procedural. The substantive problem is that usually the meaning of a word is treated in tests as a single item of information which a child either does or does not know. But word meanings are changing... The procedural difficulty with vocabulary tests is that not all children have the same understanding of the conventions of pictorial presentation... To prevent this difference among children from interfering with valid vocabulary testing, three-dimensional objects can sometimes be substituted (for pictures) (p. 362-363).

In both the Harvard and the English Infant School programs, Cazden notes, a vast amount of testing is done in specialized ways that take into account the problems in the traditional group-testbook situation just mentioned. According to Cazden, many things must be considered.

> Successful completion of the test items requires many skills in addition to understanding of the test sentence. The child has to: attend to a particular part of the page; make a recognizable mark at the desired spot, and keep up with a group pace, waiting when necessary and attending on demand (p. 366).

Reading Readiness Skills

Several theorists in reading have attempted to explicate the exact relationship of overt skills to the development of reading behavior. These theoretical hierarchies set the groundwork for the majority of the perceptual-motor sensory-motor readiness articles found in this review.

As mentioned earlier, Fries (1962) determined that learning to read was a process of transferring auditory signals to language signals (words). He envisions the three stages of learning to read are: 1) auditory to visual transfer of signals; 2) automatic response to visual patterns of signals with the child not attending consciously to the independent graphic shapes; and 3) reading to acquire new experiences and vocabulary, and reading as readily as responses to spoken language for acquisition of such experiences.

Getman and others (1968) felt a training program for reading must center around six learning stages: 1) general motor patterns, 2) special movement patterns (such as hammering, riding a tricycle), 3) eye movement patterns, 4) visual language patterns, 5) visualization patterns and 6) visual perceptual organization.

Mackworth presented a paper at the American Psychological Association Convention in 1971 pinpointing seven critical cognitive skills required for beginning reading or improvement in reading. The skills fall into three major categories of behavior: pictorial processing, verbal processing, and attention. Under the headings of pictorial processing fall the activities of recognizing left-right pattern reversals, transforming a visuo-temporal sequence into a visuo-spatial pattern, and image formation and use of internal representations. The category of verbal processing, according to Mackworth,

includes matching sentences to pictures, word prediction from a grammatical framework, and grasping sentence meaning from verbal context. A single skill exists under the heading of attention and that is concentration of attention measured by brain waves and comprehension scores.

A review of the literature published in 1970 found little written on general reading skills programs at the elementary level (Wilhour, 1970). In the dissertation, the reviewer developed some 77 reading objectives which reading authorities at St. Louis University agreed should be in a primary reading program.

In a non-experimental setting, Purdy and others (1967) of the Los Angeles city school system prepared a listing of what teachers and administrators considered developmental reading skills. This list included reading readiness activities such as hopping, skipping, jumping, tying shoes, cutting with scissors, left and rightness knowledge, visual discrimination, language usage, identification of body parts, putting events into logical sequences, and use of Radler and Kephart materials.

Should children fail to pass the various activities listed, the group recommended such remedial activities as Simon-says, rabbit hopping, using puppets, using scissors, manipulating clay, and use of Frostig, Radler or Kephart materials.

In the Los Angeles study no scientific approach to solving the problem of reading readiness was used. Instead the professional opinion of those teachers close to children was sampled. There may be some merit in such a method; however, educational research principles would dictate that this could only be a first step. The opinions should next be subjected to rigorous scientific experimentation. This apparently was not done in the L.A. school

district but the listing was simply compiled, accepted as truth, and implemented in the reading program in the district.

A factor analytic study presented at the 1971 meeting of the American Educational Research Association used six primary tests which included 35 subtests to determine a few main factors inherent in the "reading readiness" as measured by the tests (Olson, 1971). Two-hundred and eighteen first graders were administered the Gates Reading Readiness, the Frostig DTVP, the Metropolitan Readiness test, the Wechsler Intelligence Scale for Children, the Stanford Achievement Primary battery level I, and a special test constructed by the author.

Olson found four main factors existing after factor analysis which he labelled: 1) Verbal-Conceptual, 2) Auditory-Visual Association, 3) Specific Readiness factor which was found strongly in the WISC and the Metropolitan, and 4) A Specific Perceptual Organization factor.

He concluded that a need exists for the postulation of some theoretical hierarchies and sequences of abilities as they differentially contribute at various stages of learning to various finite reading behaviors.

In a study determining the cognitive development of prereading skills, Goolsby and Frary (1969) administered the Goolsby Evaluation of Cognitive Development Pre-reading Skills Instrument to 134 first graders on 64 different behavioral measures. After a factor analysis, eleven variables were found to cluster together:

1) Following simple directions in a group setting.
2) Following multiple directions in a group setting.
3) Composing an original story.
4) Recognizing written names of others.
5) Writing names of others.
6) Spelling orally names of others.
7) Distinguishing words according to initial letters.
8) Distinguishing words according to letter order.
9) Discriminating beginning letter sounds.
10) Discriminating ending letter sounds.
11) Bringing library or other books to read himself.

From the list, the experimenters concluded that two separate classes of behavior are essential for reading to begin: The ability to interact with other children and behave, and the acquisition of skills relating to phonic discrimination. Goolsby has prepared a checklist of these behaviors for others to use in their research or in school settings (Goolsby, 1969).

A similar listing of the subskills for learning to read has been developed by Eleanor Gibson (1969). Unlike Goolsby and Frary who developed their listing from discrete observation of subjects, Gibson has apparently only hypothesized the skills listed, although she too most likely has observed young reader's behavior on occasions. The reader is given no proof, however, that Gibson has made any experimental attempt to validate her listing.

The skills she found include:

1) Learning to speak the language.
2) Discriminate visually the letters of the alphabet.
3) Decoding-learning to read out in units of spoken language, that which is directed by the graphic units.
4) Learning to read in higher order units - "chunks" (p. 433).

The theory of readiness developed by Gibson is further explained as follows:

> The child must somehow learn the component letter-to-sound correspondences if he is going to be able to transfer what he has learned in reading familiar words to reading unfamiliar words (p. 436).

To do this, Gibson feels, is very difficult in English since no one-to-one relationship exists between a letter and its letter sound with regularity. She points out that this is why many educators to simplify matters, have advocated the use of the Initial Teaching Alphabet (ITA).

One final note on reading readiness is made by Gibson. She observes that, "... a child in early stages of development of reading skills reads in

short units, but is already beginning to generalize certain regularities of spelling and spelling-to-sound correspondences" (p. 439).

Anastasiow (1970) presented a paper at International Reading Association Convention on the relationship of oral language to learning to read. He found two main critical phases in this process: 1) the necessity of the child to "learn" the relationship of spoken speech to the written symbol system for speech, graphemics and print, and 2) the child's previous ability to comprehend and decode speech auditorily.

Eitmann (1969) listed a series of process skills which one obtains when learning to read. It should be noted that she does not consider these to specifically be prerequisite behaviors, but rather behaviors which occur at about the same period. No causation is implied. The activities include:

1. The ability to interpret pictures.
2. Language facility to express ideas.
3. An understanding of the meaning of 'reading'.
4. Understanding the left-to-right sequence in reading.
5. Knowing how to sweep from the end of one line to the beginning of the next line.
6. The ability to distinguish between words and sentences.
7. The ability to match identical letters, words, phrases and sentences.
8. The ability to hear sounds in words.
9. Have an interest in words.
10. Have a small sight vocabulary.

In addition, she notes that there are a few affective skills which a reading program should strive to enrich, even though they are skills not directly related to reading. These include:

1. An increase in self-confidence.
2. Desire to enjoy sounds of language.
3. The ability to work in individual groups.
4. The ability to listen carefully.
5. A maintenance of eagerness to learn to read.

A paper on curriculum design for early learning (not specifically reading readiness) found three categories, similar to the Anastasiow study (Resnick,

1967). After extensively researching the works of primarily Piaget and Bruner as well as others, Resnick determined that early learning training should center on the areas of orienting and attending skills, perceptual and motor skills, and conceptual and linguistic skills.

The on-task skills are of course needed to train pupils to follow directions, accept delayed rewards, attend to appropriate details and so on.

Resnick felt that the perceptual and motor skills underlie higher-order functioning. Included in the area are both gross skills such as general body movement through space and fine motor skills such as holding and using writing instruments. In addition, sensory skills including audition, vision and haptic responses are necessary to develop to aid in discrimination ability and higher-order learning tasks.

Conceptual-linguistic skills to be trained include classification, reasoning, spatial relations, memory and so on in order to facilitate expression and competence. Resnick feels current early childhood education programs have largely neglected this area, since many psychologists feel that children will enter and develop within this phase as a matter of maturation, and no educational intervention is necessary.

On the other hand, she further criticizes those programs that have intervened in conceptual-linguistic development because they attack conceptual and language behavior in an isolated fashion, without developing a sequence of behaviors and an overall analysis of how these behaviors fit into and mold a child schema and lifestyle.

Resnick advocates the use of task analysis and sequencing of objectives into learning hierarchies using such methods as Gagne's conditions of learning. Such a component skills analysis would result in a clearcut set of learning hierarchies for early learning.

This very type of analysis of objectives has been done by Marie Hackett in the form of the Hackett Reading System and Criterion Reading (Random House, 1971). The Hackett program attacks the area of reading, beginning with pre-reading skills and continuing through high school reading competency levels.

Initial reading behavior has been set into three phases by Root (1972). She feels that certain factors are relevant to early reading activity. This first set might be called a total-person readiness for learning. It includes such factors as:

1. Physiological: health, learning and sight
2. Emotional maturity
3. Intellectual maturity
4. Language development
   a. Picture interpretation
   b. Relating a sequence of events
   c. Repeating a theme of a story or poem
5. Visual discrimination
   a. Color identification
   b. Similar and different shape identification in two- and three-dimensions
6. Auditory discrimination
   a. Identify similar and different sounds
   b. Identify and produce rhyming words
   c. Repeat sound patterns
7. Left-to-right direction
   a. Making left-to-right lines in a confined space
   b. Following a picture story - placing pictures in sequence

Root's second level in reading behaviors consists of those activities related to word recognition skills. These skills which might be called "word attack" skills include:

1. Acquisition of a sight vocabulary
2. Ability to deduce some words from contextual clues
3. Ability to break down words into sound units
4. Ability to blend sounds

After the child is considered a fluent reader, Root feels certain study skills need be established to insure the progress of the new reader. This final group of reading skills includes:

1. Selection of the main idea from a passage
2. Arrange related ideas into sequence
3. Summarize a book or its parts
4. Use of a dictionary, index and table of contents
5. Use of reference books
6. Making things from directions
7. Reading maps
8. Reading and acting on instructions

The first sequence of skills presented are needed to begin reading activity, Root feels. The second group of behaviors are distinct beginning reading skills and the third group are advanced activities which will aid in further reading development.

Reviews of the research literature on reading readiness have not yielded conclusive results. This review will attempt to discern if any clearcut knowledge into the reading process has resulted from recent research by categorizing articles in a different way than has been done by previous reviewers. Articles will be categorized according to the type of pre-reading training which was administered to subjects. In this way such conclusions can be reached as to the efficacy of training in gross-motor, fine motor, visual-motor and visual discrimination perception skills.

The categories to be reviewed include gross motor skills (large motor behavior), fine motor skills (small motor intricate behvaior), visual-motor and visual-discrimination training, and auditory training.

Gross Motor Training Programs

The following section presents a series of articles and other works which are based on the use of gross motor (large muscles), perceptual motor or sensory motor training programs in order to facilitate reading. Typically, the authors are testing hypotheses that without such training, the subject will not do as well or progress as rapidly as he could have, had he been given the additional stimulation offered by sensory motor or perceptual motor programs.

It is interesting to note that although the need has been cited in many articles for long term longitudinal studies relating various readiness training programs to resulting reading abilities both in first grade and more critically, at intermediate and junior high levels, only one study (Falik, 1969) has been found in the literature. Many of the studies cited lasted only a few weeks, with the longest typically being a full year. Apparently the need for long term evaluation of readiness programs still exists.

Nationwide, many perceptual motor readiness programs have been established by elementary teachers due to the influence of Frostig and Horne (1964) and Kephart (1960), and Radler and Kephart (1960). It should be pointed out here that Frostig designed the Frostig Program for the Development of Visual Perception to be used with visually-perceptive handicapped children, not the ordinary child. It is going beyond the Frostig theory to presume that the FPDVP administered to "normal" children will be crucial to developing their readiness to read, or even beneficial at all. Yet, time and again, Frostig materials appear in school readiness programs, either as the complete program or as supplemental pieces in the regular curriculum.

There have been research studies in which the FPDVP has been shown to produce post-test gains on the Frostig Developmental Test of Visual Perception and on readiness tests such as the Metropolitan, but usually the research design is lacking.

Drawing from the theoretical bases of Gesell and Piaget, Radler and Kephart hypothesize that anything a child learns, can be taught. A child learns to move about, and thus it can be taught. Reading, they feel, is an extension of motor movement in a special way, especially through vision (Radler & Kephart, 1960).

> All behavior is movement of one kind or another and movement made by a developing child constitutes learning units that contribute to his total store of knowledge (Radler & Kephart, 1960, p. 24).

One study by Kephart, the chapter noted (p. 33), shows that elementary students with "rigid" posture were low achievers, while those with "loose", flexible postures were high achievers.

Specifically, Radler and Kephart feel that the connection between perceptual motor skills and reading is that a child perceives a word first as a shape, a blob, and he may or may not later learn to distinguish the components of the blob into letters and sounds. Thus book = = dark. The child can't associate the letters with anything. This "form perception" develops from fundamental skills of laterality, posture, and directionality. These subordinate motor skills can be easily taught and trained (pp. 48-49).

The typically recommended motor skill programs mentioned by Radler and Kephart that included angels-in-the-snow, the walking board, the balance board, and drawing games.

Getman and Kane (1964) list four main points in speaking of perceptual-motor programs (p. iii):

1) Academic performance in today's schools depends heavily upon form and symbol recognition and interpretation.
2) There are perceptual skills which can be developed and trained.
3) The development of perceptual skills is related to the levels of coordinations of the body systems, that is, the better the coordinations of body parts and body systems, the better the prospects are for developing perception of forms and symbols.
4) The child whose perceptual skills have been developed and extended is the child who is free to profit from instruction and learn independently. The greater the development of perceptual skills, the greater the capacity for making learning more efficient.

A few years later Getman and Kane and others made a clear distinction of what a training program for the development of visual perception should include. The program has six stages with activities described for stages one through five, the authors feeling that stage six emerges from the other levels (Getman, Kane, Halgren, & McKee, 1968). The stages and activities include:

1) General Motor Patterns - basic movements such as angels-in-the-snow, situps, feet lift, jump board, trampoline, etc.
2) Special Movement Patterns - hammer and nails use, building with Lincoln logs, tricycle, wheelbarrow, etc.
3) Eye Movement Patterns - looking and reaching for, follow a golf ball, eye shift near to far, pencil on wall calendar.
4) Visual Language Patterns - verb games, picture description, story telling, opposites.
5) Visualization Patterns - jigsaw puzzle, sorting objects, visual memory games, coloring books, and visual projection.
6) Visual-Perceptual Organization.

In a manual developed for use by classroom teachers, Kephart (1960) sets up four basic segments of pupil training, chalkboard training, sensory-motor training, training ocular control, and training form perception. The section on sensory-motor training includes such activities as exercising of muscles or groups of muscles. First to be developed is balance and then body image, bilaterality and unilaterality. The activities recommended include walk on a walking board forward, backward, sideways, turn and bounce; balance board and trampoline, angels-in-the-snow, duck walk, rabbit hop, crab walk,

elephant walk. All these teach variations in movement patterns, Kephart explains, and provide opportunity for elaborating learned patterns.

Kephart notes that readiness skills are sometimes considered as something which the child acquires either through maturation or through functioning of innate responses. Instead, he feels that readiness skills can be broken down into more basic types of activity, and that is what the Slow Learner in the Classroom is devoted to analyzing (p. 31). He also notes that perceptual-motor functioning is an input-output relational activity -- a total process (p. 63).

Lipton (1970) studied the relationship between visual perception and reading readiness in first grade children. His study used four classes which were matched on age, height, sex and weight and then randomly assigned to treatments. Two classes were used for the experimental situation and two classes were assigned to the control treatment which consisted of a regular first grade curriculum, including reading readiness skills unit.

The experimental classes were administered a program that emphasized directionality of movement and ability to comprehend spatial relationship of objects surrounding the child. Following the recommendations of Kephart, the program included activities such as angels-in-the-snow, Simon says, walking, jumping, rolling, kicking, catching, balance beam, rhythm to music, and so on. These activities, Lipton states were used in order to develop the following skills:

1) balance and maintenance of posture and locomotion.
2) walking, running, jumping, kicking, throwing, etc.
3) coordination, dynamic balance, speed, accuracy, strength.

Some of the commands which emphasized spatial relations included, "Lift your left arm sideways over your head", "Throw the ball up in the air and backwards over your head".

The experimental groups also were exposed to the regular first grade program, including the reading readiness skills.

Both groups were pre- and post-tested using the Purdue Perceptual Motor test, the Metropolitan Reading Readiness test and the Frostig Developmental Test of Visual Perception. A two-way analysis of variance was performed with each test, the factors being teachers and treatments. Lipton found significant differences on all gain scores and interactions between teachers and treatments except for the teacher/treatment interaction in the Frostig test.

From these results, Lipton concluded that a physical education program that emphasized directionality of movement produced significant gains in perceptual motor development, visual perception and reading readiness, as measured by the three instruments.

A similar sensory-motor training program was tested on kindergarten children who scored low on the Goodenough Draw-A-Man test but had average IQ's as measured by the Stanford (Painter, 1966).

Twenty selected subjects were pre- and post-tested with the Illinois Test of Psycholinguistic Abilities, the Goodenough, and Beery Geometric Form Reproduction test. Hypotheses examined in the experiment were:

1) A systematic program of rhythmic and sensory-motor activity will affect the level of ability to draw a human figure.
2) The program will ameliorate the apparent distortion of body image concepts.
3) The program will improve visual-motor integrity.
4) The program will improve sensory-motor spatial skills.
5) The program will improve psycholinguistic abilities.

Painter administered 21 half-hour sessions of the treatment program over a seven week period to the 20 subjects. There was no control group. The treatment program followed the movigenics theory of Raymond Barsch and the perceptual-motor programs designed by Newell Kephart. There were some 38

different sorts of activities in the program including, for example, Simon says, skipping, jumping, picking up pins or paper bits from a smooth surface, tap drum rhythm, etc.

The results of the experiment showed gains in all hypotheses tested, according to Painter. The experimenter did not specifically test reading readiness ability but approached it when testing with the Illinois Psycholinguistic test. Although Painter concluded that the sensory-motor program dynamically improved pupils body image concepts, rhythm, visual-motor integrity, spatial skills and psycholinguistic abilities, there is no way to ascertain that the results were not due to mean regression or Hawthorne effect.

The relationship of prekindergarten training to first grade reading achievement in disadvantaged first graders was tested in Myra Campbell's dissertation (1969). In the study, 320 students were used from a pool of 974 children initially tested. There were four experimental groups in the study. Group one was given sixteen weeks of pretraining and non-pretraining activities; group two was given eight weeks of pretraining and non-pretraining, and groups three and four were each pretraining-only groups for the duration of the experiment.

Campbell concluded that pretraining was positively related to first grade achievement with respect to disadvantaged children.

A perceptual-motor play program was administered to 76 kindergarten children by Rutherford (1965) in a study designed to assess the effects of perceptual-motor training on readiness. The treatment trained for body image concepts, visual-kinesthetic matching, laterality, directionality and eye control.

Rutherford concluded the experimental group did significantly better than the control group on the Metropolitan Readiness test for reading but

not for mathematics. In addition he notes that kindergarten boys achieved more from the training than did girls. Since most control is lacking in the design, little scientific evidence can be gleaned from this study.

In the mid-1960's C. H. Delacato presented a theory on the use of motor training as a critical factor in the development of reading readiness for children (1966). The theory in Neurological Organization and Reading holds that the phylogenetic development of the central nervous system is reflected in the development of the nervous system of each human. If for any reason the neurological development of a child does not proceed through a "certain sequence of stages", the child will exhibit difficulties in mobility and speech and in the "essence of the human nervous system, reading" (p. 44).

Delacato went on to explain that reading difficulties stemming from poor neurological organization can be corrected by training the child to be neurologically well organized. Unfortunately, Delacato and his followers did not heed the word of Delacato himself, that those with "poor neurological organization can be corrected by training...". Instead, it was hypothesized that since Johnny could not read well, he therefore was neurologically disorganized and needed the Delacato treatment to read better. Delacato researchers did not first diagnose neurological disorder but rather treated an observed symptom (poor reading) as if it were the disease itself.

In 1967 Glass and Robbins reviewed the twelve major articles generally considered to be the major defense articles of Delacator theorists. Their conclusion was that serious doubt was cast upon all twelve studies' validity.

Specifically, Glass and Robbins found the following major faults with the Delacato articles:

1. Nearly all experiments used matched groups rather than randomization, and in some cases the subjects were volunteers for membership to one group or the other.

2. Nearly consistently, the experimental and control pupils were treated as intact units.

3. The various classes met at different times of the day.

4. Different teachers were used for experimental and control groups.

5. The sample size in the studies was too small.

6. Statistically invalid analysis was performed due to grouped raw data means and mean regression uncontrolled.

7. Experimental bias was not controlled. Enthusiastic Delacato teachers were used for the experimental group.

8. There was no control for the Hawthorne effect.

Glass and Robbins stated that the position of their research on the Delacato theory was that: "Extravagant claims have been made for the validity of experiments which Delacato has reported as supporting his claims. Without exception, these experiments contained major faults in design and analysis... At best, uncontrolled factors inflated small but legitimate effects due to Delacato's therapy in each of the experiments; at worst, these uncontrolled influences were the sole sources of gains or differences between experimental groups" (p. 49).

Dissatisfied with the devastation dealt the Delacato theory by Glass and Robbins, two other experimenters attempted to resupport Delacato with a well designed experiment. Stone and Pielstick (1969) felt that the Delacato theory itself had not been disproven, but only that Glass and Robbins had refuted studies done to date because of defective research techniques. The theory itself had not been attacked by Glass and Robbins.

The 1969 experiment used 26 kindergarten subjects, randomly selected and assigned to treatment groups. The experimental pupils received thirty

minutes per day (Monday through Friday) of Delacato "neurological training" which consisted of cross-pattern creeping, cross-pattern walking and sleep patterns, as well as following Delacato's "do's and don'ts". The parents of the experimental pupils watched the treatment and were urged to continue the training during Saturdays and Sundays.

The control group was given thirty minutes of intensive play and games activity every day and their parents were urged to provide a specific parent/child 30 minute play period during the weekends as well. This was intended to control for Hawthorne effect, something that had not been done in the earlier Delacato studies. Both groups otherwise received regular class activities.

The experimental period lasted for eighteen weeks with all subjects being pre- and post-tested with the Peabody Picture Vocabulary, the Lee-Clark Reading Readiness test and the Frostig Test of Visual Perception (FTVP). Data was analyzed using ANCOVA with pre-test measures serving as the covariate to adjust for differences between pre-test means. Results indicated a significant difference between groups only on the FTVP (alpha .025). There was also a significant gain made by both groups on the Peabody test.

The experimenters concluded that no support could be found for the Delacato program enhancing reading readiness scores for kindergarten pupils. They indicated there may be some advantages for use with lower sensory-motor developed children but Robbins (1966) has suggested that this is also unlikely.

A well-designed study by Louis Falik (1969) attempted to determine whether perceptual-motor training in kindergarten would enhance the later reading skills of students.

Subjects were selected from those kindergarten pupils who scored in the lower two-thirds of a distribution of scores on the Anton Brenner Developmental Gestalt Test of School Readiness. These below gifted-level children were then

randomly divided into control and experimental groups, balancing for sex. The two groups were then assigned to teachers judged equally competent.

In the experimental treatment, the curriculum was restructured to follow the perceptual-motor programs developed by Kephart. Included in the activities were chalkboard training, sensory-motor training such as use of the walking board, training ocular control and training form perception. In addition there was training in identification of body parts, drawing clothing articles and so on.

The control group spent the year with the other teacher, in a standard kindergarten program except for a semi-structured experience designed to correspond in setting and general activity to the experiences of the experimental group.

After the year-long treatment, pupils were post-tested with the Brenner Gestalt, the Metropolitan Readiness test and a basic perceptual-motor development test to determine if the two groups could be differentiated in terms of their perceptual-motor development. The perceptual-motor test included subtests of dominance patterns of eye, hand and foot; left-to-right directionality; pegboard skills; hopping, creeping, and walking beam abilities; depth perception; figure-ground perception; formboard assembly; keystone binocular vision; and visual reach-grasp-release abilities. On the perceptual-motor test, pupils were scored along a continuum from "immature/undifferentiated" to "mature/well differentiated".

Since the post-testing was done on an individual basis, it was necessary to not allow the testers to know which pupils were from the control group and which were from the experimental group.

In addition to the post-testing after the kindergarten year, pupils were retested in the middle of second grade using the Metropolitan Achievement Test

Primary II Battery, Form B.

The results showed no significant differences between the experimental and control groups at the end of kindergarten on any of the three instruments, indicating there were no differences in developmental readiness, reading readiness and perceptual-motor development for the two treatment groups. Results from the grade two testing also showed no significant difference between groups but it was noted the control pupils' scores remained fairly homogeneous while the experimental pupils' scores showed a considerably greater range.

Falik cited no Hawthorne effect and no reading gains by the experimental groups that the control subjects did not equal. He did note that some eleven children (about a quarter of the sample size) scored high in perceptual-motor skills but low in reading ability, and cites this as evidence for further research into the existence of such false positives.

The greatest flaw in the experiment was the small sample size and the use of only two teachers, one for each situation. Although the two teachers were judged equally "competent", this does not ascertain true equality between pupil treatments. It is possible that the control group teacher favored the style of teaching she was using and the experimental group teacher did not agree wholeheartedly with the perceptual-motor program. Additionally, the control group teacher knew her class was the control class and this may have caused her to strive harder and push the children into greater than usual achievement.

Another experiment using a physical education program as special treatment, investigated whether there would be any difference between groups on measures of reading readiness, visual perception and perceptual-motor development (August, 1970). A physical education program which emphasized laterality and

directionality was developed and applied to five and six year old kindergarten pupils in a hypothesized attempt to show significantly greater gains by the experimental classes.

There were six experimental and six control classes of twenty subjects in each group (N=240). Children were pre- and post-tested using the Metropolitan Readiness test, the Frostig DTVP and the Purdue, to measure reading readiness, visual perception and perceptual-motor development respectively.

All children received a 36 session physical education program, with the control group receiving a conventional program, in contrast to the experimental program defined above.

Post-testing results showed significant differences between groups for the measures of visual perception and perceptual-motor development, indicated in two-way analysis of variance. There was no significant difference detected between the groups with regard to reading readiness scores. August concluded that changes in perceptual-motor performance did not significantly affect changes in reading readiness.

The overall impact of both the Falik and the August studies is that given specific perceptual-motor training, visual perception and perceptual-motor development may or may not be altered, but reading readiness ability is not affected.

A factor analytic study was done which confirmed August's theory with regard to the lack of relationship between P-M development and reading readiness. Trussell (1967, 1969) examined the scores of elementary pupils on the Frostig DTVP and the Oseretsky Motor Development Scale. Subjects in the study were not from culturally disadvantaged backgrounds.

The factor analysis generated in the study showed reading skills, perceptual skills and motor skills form patterns and associations among themselves rather than breaking into constellations of associated visual-perceptual-reading variables, generally hypothesized as indicative of the normal developmental sequence. Trussell concluded that her results do not support the use of perceptual motor evaluations as a diagnostic tool to identify subjects with basic reading difficulties; nor do the results substantiate the use of perceptual-motor programs to improve reading skills.

Another study selected kindergarten pupils for training in perceptual-motor development, while using a control group that received special attention for equivalent lengths of time and a control group that received no special attention (Roy and Roy, 1968). Forty-five pupils were randomly placed into one of the three treatment situations at the beginning of the school year. The program lasted the entire school year.

The special perceptual-motor training was administered to the experimental group once a week for twenty-five minutes. The program consisted of some Frostig materials sound effects, mazes, jigsaw puzzles, Simon Says and so on, using both gross and fine motor systems. During this same length of time control group one received an "augmented attention program" but no perceptual-motor training.

All subjects were pre-tested on the Frostig DTVP and no significant differences between groups were detected. Pupils were post-tested for reading readiness ability using the Lee-Clarke test. Analysis of the data was performed by using the Lee-Clarke score as an independent variable and the Frostig score as well as chronological age as covariates. The total analysis of covariance yielded no significant differences between groups; however, Roy and Roy concluded that the Frostig test accurately predicted reading readiness

scores and chronological age was of no value in prediction of reading readiness scores. In addition, the experimenters pointed out that there were trends in the results indicating possible relationship between perceptual-motor training and reading, but this was not statistically supported. Finally, they concluded, teacher personality was probably a strong factor in the success, or lack thereof, of a readiness program.

In summary, we have noted that most of the experimentation being done with reading readiness in gross motor training programs have followed the theories of Frostig, Barsch, Horne, Radler and Kephart. Some positive results were obtained, such as Lipton's conclusion that a physical education program of directionality increases perceptual motor development, reading readiness and visual perception. Painter also found that motor games and exercises tended to improve perceptual motor activities in general and some psycholinguistic abilities. Gross motor training was found to be an asset in Rutherford's study as well. All of these studies suffered to one degree or another in experimental design. Frequently no control groups were used in the experiment, the sample size was too small in other cases and quite often the experimenters' conclusions did not necessarily follow the indications of the data. In no case was a replication cited in the literature, causing one to question seriously if the results described could be repeated by the same experimenter or someone else.

The criticisms Class and Robbins levelled at the Delacato studies can equally well be aimed at most of the gross motor studies reviewed here. It seems that in the five years following Glass and Robbins' report few have made the effort to strengthen their research failures. The single well-designed attempt by Stone and Pielstick resulted in improved visual perception (measured on the FTVP) but not in reading readiness. Falik's carefully controlled program also failed to show the usefulness of gross motor programs in facilitating beginning reading.

Approaching the problem differently, Trussell's factor analysis between visual motor scores and motor development scale scores also yielded no significant relationship between perceptual motor evaluations and reading.

All in all, it seems fairly apparent that those who support the use of perceptual motor programs in early childhood education for the purpose of facilitating reading have not provided substantive evidence to validate their claims. In fact, it appears that gross motor training programs most likely have no effect whatsoever on a child's reading readiness.

Fine Motor Training Programs

This section presents a series of articles and other works which are generally based on the use of fine motor (small dexterity muscles), perceptual-motor or sensory motor training programs in order to facilitate reading.

Ellerman and Wadley (1970) questioned whether children's intellectual abilities as measured by the Vane Kindergarten test improve after being given a program of verbal development, body awareness concepts and perceptual-motor skills.

Sixty-four kindergarten children were assigned to control or experimental treatment according to the hours of their school session. Experimental children attended in the morning, while control children attended school in the afternoon. This experimental design exhibited weak control of extraneous variables such as child behavior in early morning is different than child behavior right after lunch, and so on.

The Vane subtests of perceptual-motor (reproduction of three geometric forms), vocabulary (learning words from a prescribed list) and man (a drawing of a human task) were both pre- and post-tested.

The experimental group's training program consisted of EDL Controlled Reader materials for readiness and motility training, Frostig ditto materials and the Winter Haven templates. The program stressed body concepts, body functions, anatomical location and placement, and gross and fine differences of parts and relation to the whole person.

The control group did not receive any of the above enrichment materials.

Non-statistical analysis of the data indicated, according to the experimenters, the control group had no significant pre-post gains but the

experimental group scored an average of ten points higher on the post-test IQ and subtest, and had slight gains in the vocabulary and perceptual-motor subtests. Also, it was noted that the experimental teachers felt their children indicated more overall improvement and maturity. It should be kept in mind that all such conclusions are subjective and are not experimentally proven.

A study of eye-hand preference in relation to reading in first grade children showed no relationship between eye-hand preference and performance on either total readiness scores or visual-motor subtests (Stephens, Cunningham and Stigler, 1967).

The experimenters hypothesized that reading disability is a result of impaired neurological function of a minimal type, as evidenced by poor general coordination, inadequately established brain dominance and resultant problems in development of unilateral eye-hand dominance patterns. This theory was not substantiated since they found that children with crossed preference patterns performed as well on readiness tasks as those children with unilateral dominance.

Jensen and King (1970) conducted a study of the effects of different kinds of visual-motor discrimination training on learning to read words. Their purpose was to compare the effectiveness of such training, using relevant word-forms, on learning to read a word list by tactile tracing of textured word-forms, manipulative rearranging of individual letters to conform to a model of a word, or by choosing the matching word from four printed response choices.

The experimenters found in the training that the tracing technique was significantly easier for subjects than either the matching or the rearranging,

and that matching was easier than rearranging. There was no significant difference found between the three groups for responses on a reading task. The experimenters' explanation was each child probably has an individual learning mode and the training method was not necessarily correct for each child.

Such a conclusion was substantiated by the fact that within each group of pupils, some scored very low and some very high on the reading of relevant words. The conclusion reached called for the development of a method to assess the training mode strengths of each child, thus allowing a special visual-motor discrimination training program for individual needs to be developed. Lloyd (1966) also reached the same conclusion.

Pryzwansky (1970, 1972) trained pupils with a specialized form of visual-motor discrimination, manuscript writing. He felt that too much previous research emphasis has been placed on studies using materials not directly related to reading skills, such as geometric forms. The hypothesis set forth was that if manuscript writing was presented to pupils as a visual-motor task, it intuitively would appear to be a more beneficial type of reproduction training due to the fine-motor exercising involved. In addition, he hypothesized that learning to reproduce alphabet letters will increase readiness scores more than fine-motor programs of similar kindergarten activities such as buttoning and zipping.

Three groups of kindergarten students were used. One group was trained using fine motor exercises associated with the Template Training program. The second group was trained using the paper and pencil exercises of the Frostig visual perception program. A final group was trained using the Peterson Manuscript Writing program for grade one; this group was designated the experimental group. Each group received the specific training for fifteen

minutes per day, four days a week.

Pupils were pre- and post-tested with the Gate MacGinitie Readiness test, the visual discrimination subtest of the Harrison-Stroud Reading test, the Readiness Profile, and a letter-like form experimental test. Variation between schools pre-test scores was statistically adjusted.

The results showed that the perceptual-motor program (Frostig) did not significantly improve the kindergarten children's reading readiness or word discrimination ability compared to the regular kindergarten program. Further, Pryzwansky concluded that schools using the manuscript writing had significantly better reading readiness scores but not word discrimination ability. And finally, that no group differences were found between word and word-like form discrimination for any group.

This study indicated a need for further exploration into the use of manuscript training as a form of fine sensory-motor training which yields the added benefit of enhanced reading readiness.

Visual discrimination skills are prerequisite to reading because one must be able to differentiate between "ascenders" and "descenders" as in b and P, left to right orientation such as d-b and p-q, and in closure such as in o versus c and e, explained Betts in a recent article (1968). He defined discrimination as "using cues to distinguish one form from another. Discrimination emphasizes letter and word forms as stimuli."

Perception was defined as "structuring stimulus to arrive at a meaning", for example, labeling a drawn outline of a diamond as a diamond, decoding the word "cat" into speech with what it symbolizes.

Betts described in his article a study done by Bosworth at the Reading Research Lab, University of Miami. In the study two groups of randomly selected kindergarten pupils were divided into a control group which participated in

regular kindergarten activities; and an experimental group which received distributed instruction on visual-motor skills in addition to regular kindergarten program. Each pupil in the experimental group received training at his own level of achievement and progressed at his own pace.

The experimental group's instruction was in two steps: first they were trained in development of concepts and figures and secondly they were trained in figure reproduction. Different input modalities were used in the training such as tracing, matching shapes, and freehand copying.

The results of the experiment showed that visual motor skills can be developed, and that this instruction increases the range of achievement for a five year old. In addition it was concluded that visual-motor skills contribute to word discrimination, a factor in perceptual readiness for reading.

Bosworth used a well-controlled experiment to teach through individualized instruction, abilities in visual-motor concepts and coordination. It was concluded from the study that such training for five year olds can actually increase perceptual-motor achievement ranges. A further conclusion that visual-motor skills contribute directly to word discrimination was noted but not substantiated to any degree in the Betts article.

Aspridy (1971) tested the specialized training program of block building to see how it related to reading readiness scores in predicting first grade reading success. In the study 68 kindergarten children made block constructions which were rated by five kindergarten teachers for creativity, solidarity, individuality, etc. According to Aspridy, the study confirmed that block-building behavior may be used as one means of assessing children's cognitive readiness for beginning reading, although it is a less efficient predictor of achievement than the Metropolitan Readiness test, which was also administered.

Coisman (1972) attempted to prove the value of the Frostig program in kindergarten, however failed to find a significant difference between the experimental and control groups. Kindergarten pupils were tested on the FDTVP and the Peabody Picture vocabulary test, as well as rated by their teachers on reading potential. The subjects were then match-grouped according to their PQ score (a Frostig measure of deviation score obtained from the sum of the perceptual subtests, after correction for age), sex, IQ, and reading potential. The experimental group was taught by trained volunteer program workers using the Frostig program for fifteen weeks, one hour per week. Activities included exercises, paper-and-pencil exercises, and creative play. The control group was allowed one hour per week of free play or art.

Subjects were post-tested with the Metropolitan Readiness test,.the FDTVP, and the California Test of Reading. No significant differences were found for visual-perception measures, reading readiness or reading ability. The experimenter concluded that perhaps if the program had been longer it would have been more useful. He did note that the use of trained "understanding theraputic housewife volunteers" for the experimental group appeared to be a good idea.

A summary of the fine motor training program yields mixed results. Several authors (Stephens and others, Jensen and King, and Pryzwansky) found no solid relationship between their experimental program and the children's resulting reading readiness abilities. However, the Betts' described Bosworth study cannot be passed over lightly. Bosworth carefully developed an experimental rationale and successrully applied it to his program, obtaining significant results.

At this date it would therefore be wisest to state that one cannot dismiss the claims that fine motor training enhances reading readiness. There must

be more research of high calibre conducted to clearly answer the questions which still exist today. This task should be accomplished soon, since many new reading programs are being developed at the state and federal levels for diffusion in the form of reading performance objectives. It will be extremely useful for the classroom teacher at the primary level to train her pupils in skills that will make a difference in reading ability.

Visual-Motor and Visual Discrimination Perception Training Programs

This section presents a series of articles or other works that are generally based on training pupils to read using visual-motor or visual-discrimination training. Some of the articles in the preceding section, although primarily fine-motor training studies, also occasionally used visual training in their studies. Articles cited herein contain primarily visual training programs but some programs also include fine-motor training and/or auditory training. No clearcut categorization of training programs is possible.

According to Frostig and Maslow (1969), the theory underlying the Frostig Program for the Development of Visual Perception (FPDVP) is fundamentally that visual perception development occurs between 3½ and 7½ years, and therefore, not all primary children in kindergarten have attained adequate visual development by the time they begin being taught reading. This assumes of course that reading is taught in late kindergarten or early first grade when a child is 5½-7 years old. The underdeveloped child will show an inability to perform everyday tasks and be clumsy, as well as have reading (symbol identification) difficulty -- all this, Frostig feels is not necessarily related to intelligence but is a totally separate issue.

Part and parcel with the FPDVP is the Frostig Developmental Test of Visual Perception (FDTVP) which measures five areas of visual perception: 1) perception of position in space, 2) perception of spatial relations, 3) perceptual constancy, 4) visual-motor coordination and 5) figure-ground perception.

The preface of the FPDVP states that not only is the program designed for visual perception specialists use but also for the teachers of specialists

and for children with learning difficulties. "The worksheet exercises can benefit all children in kindergarten and first grade by stimulating visual perceptual development before academic skills are required. FPDVP should be augmented by language training..." (Frostig and Horne, 1964, p. 13).

Elsewhere in the program, Frostig states that the FPDVP is not necessarily for the average child, slightly in contrast to the previous quote. Essentially, the point is that not everyone must have training with the FPDVP to begin to read, but it certainly will not harm anyone to be exposed to it.

In a study with culturally deprived children, not necessarily underdeveloped in visual perception, Alley, Smith and Angell (1968) applied the FPDVP for 25 minutes a day for 18 months to develop reading readiness as measured by the Metropolitan Readiness Test, and the FDTVP. The results were that 11 of the 13 FDTVP test variables' means favored the experimental group and five of the eight variables of the Metropolitan were significantly higher for the experimental group. The authors concluded that their hypothesis of the FPDVP being an effective tool in developing reading readiness, was supported.

The reader cannot be sure the positive results shown were due to the FPDVP or to validity factors such as maturation, regression to the mean or, most likely, a Hawthorne effect, caused by the additional attention given to the experimental subject.

Another study using the Frostig DPVP asked two basic questions. Gamsky and Lloyd (1971) questioned whether children in kindergarten who learn via the FPDVP will do better than a control group when tested with the FDTVP, the Metropolitan Reading Readiness Test and the Stanford Achievement test, and they asked if the Frostig test would predict those children who would have later difficulty.

In an analysis of their results, it was shown that the Frostig-trained group performed significantly better on the FDTVP than the control group on figure-ground perception, position in space/perception, spatial relationships and PQ (Perceptual Quotient - a deviation score obtained from sum of perceptual subtest scale scores after correction for age), and perceptual constancy. When post-tested on the Stanford Achievement, the Frostig-trained group scored higher on word reading, paragraph meaning, spelling, word study skills and arithmetic. It was also noted that girls scored higher than boys. The experimenters concluded that the FDTVP appeared to predict those who would do poorly in reading later on, but they noted that those who did poorly also seemed to gain the least from the Frostig program.

Gamsky and Lloyd used a control group in their experiment with the FPDVP and obtained significant results but also found an unexplained problem. Those pupils whose pre-test scores were low on the FDTVP (thus indicating some visual perception difficulties) gained the least. Assuming that the FPDVP is designed to aid the low scoring child, one cannot help but wonder about the possible benefits of the program itself. Such a discussion, however, is beyond the scope of this paper.

Fortenberry conducted a study on the value of the FDPVP for reading training with deprived first graders (1969). Two experimental groups used the FPDVP for twelve weeks in addition to their regular reading program. Control classes received a readiness program as outlined in their basal reader manual. Pupils were eliminated from the study who scored low on the Metropolitan, or exhibited loss of hearing or visual defects.

After the twelve week experimental session, all pupils were post-tested with the Gates Primary Reading test, and then retested at six and twelve weeks after the experiments' conclusion. The results indicated that there

was a significant difference in the level of word recognition ability for the experimental group at the end of the study but this gain balanced out after twelve more weeks and was insignificant at that time. The same was true for the total reading scores. In addition, both groups had significant gain scores for reading and word recognition, but after the post-experimental period, no differences could be detected between groups.

Fortenberry concluded that the Frostig program did provide initial improvement in reading scores but that the boost was not lasting and therefore of no real value for the special effort teachers had to make to present the additional materials.

A study by Church (1970) on the effects of two types of visual perception training programs for kindergarteners showed no significant results between groups. One group of children was trained with the FPDVP and the other group worked with experimenter-developed materials. These materials included boxes of buttons, shapes and colors, felt cutouts, a toy train with a track to follow and so on. After training with the materials and the more structured Frostig program, the subjects were tested for reading readiness. No significant differences were found between groups but significant pre-post gains were noted for both groups.

The experimenter concluded the statistical analysis indicated no superiority of one method compared to the other. In addition teacher opinion was assessed. The teachers felt that the subjects in the unstructured program showed higher motivation and interest than those in the Frostig program.

A study using the Frostig program for primary-aged children diagnosed as having visual perception difficulties was done by Stern (1972). In the study three groups of children identified as pupils with visual perception deficiencies were used. One group was administered the Frostig DPVP; a second group

received a placebo program to control for Hawthorne effect; and a third group received corrective reading instruction on an individualized basis. All subjects were pre- and post-tested with the Frostig DTVP, the Gates Readiness test, the Survey of Primary Reading Development and the Gilmore Oral Reading test.

Analysis of the data led the experimenter to conclude that the Frostig materials and corrective reading program were significantly superior to the placebo attention program but neither the FPDVP nor the individualized corrective program were superior to each other. Also the experimenter found little data to indicate that the treatment groups differed in any amount of test score change of silent reading measures.

Stanchfield (1971) designed an experiment which would avoid biased results, in relation to the type of subjects selected. The rationale of the experiment was that most readiness work apparently had been done with disadvantaged kindergarten through second grade subjects because they lacked the middle and upper-class background on which others begin their formal education. Stanchfield also felt that those studies where no significant difference was found between treatment groups in upper and middle class students may have occurred because the rich home environment may encourage readiness enough on its own.

This particular study was designed to emphasize listening for comprehension of content, listening for auditory discrimination, visual discrimination skills, oral language skills, motor-perceptual skills, and sound-symbol correspondence skills. Subjects for the study were selected from seventeen schools on the basis of providing a cross-section of socio-economic background. Subjects were then randomly assigned to experimental or control group conditions. In the control group, a "regular curriculum" of kindergarten activities was

provided. The experimental group had specially trained teachers, who had been pretrained in teaching the above specified skills. The teachers attended regular workshop groups and had an available manual for the program. The experimental treatment was taught during the regular language arts block of time.

Some of the materials in the experimental package included "picture cards" from which subjects practiced noting details, story telling, drama and inspired paintings; "flannelboard" for cutout story characters; "puppets"; books and "phoneme boxes" which contained objects beginning with the same consonant.

Motor-perceptual training consisted of coordination of vision and movement through games, dances, cutting, pasting, tracing and paper and pencil exercises.

The results of the study indicated that there were significant differences on all three main effects, using a three-way analysis of variance. The variables were sex, experimental-control, and ethnicity. The experimental group scored significantly higher on phonemes, letter names and learning rates when post-tested with the Murphy-Durrell Reading Readiness Analysis as a criterion measure of reading ability.

The conclusion of this study was weak in that it did not highlight one very notable characteristic of the study. More emphasis should have been placed on the use of the teacher pre-training program prior to the experiment and the frequent teacher interaction meeting held during the experiment. It is felt that much of the gain detected in experimental subjects may well be due to the preparedness of the teachers administering the project, as well as or instead of the use of sensory-motor materials themselves.

Katz and Deutsch (1963) lend support to the need for perceptual-motor programs with their study. They tested the hypothesis that the perceptual skill of processing sequentially presented auditory and visual information may discriminate between good and poor readers. This was founded in the theory that poor readers are those who cannot shift from one sensory input modality to another easily. Significant differences were found, thus supporting the authors' theory.

The Spiral after-effect (SAE) phenomenon was used to test for the relationship between reading readiness and maturational unreadiness in a study by Snyder and Freud (1967). Using 667 normal first grade students, they found that between 25% and 80% of the 6-7 year olds could not experience the perceptual phenomenon SAE which 100% of a group of ten year olds could. The experiment was designed to emphasize the use of the SAE as an educational diagnostic tool. By using it, the experimenters contended, a teacher can learn which first graders are not ready to read.

A doctoral dissertation attempted to determine the effectiveness of an informal conceptual language program in developing reading readiness (O'Donnell, 1968). Seventy-eight subjects of kindergarten age were pre-tested on the Metropolitan Reading Readiness Test; the Wechsler Intelligence Scale for Children; the Wepman Auditory test, form I; the Allyn and Bacon Pre-reading test, Form I; the Gesell School Readiness test; and the Social Adjustment Scale. They were then randomly assigned to one of two treatment groups for 116 days of treatment, twenty minutes per day devoted to the special program and the rest of the day routine kindergarten activities.

One treatment exposed the children to a commercially prepared basal reader, Getting Ready to Read. The other treatment informally exposed the

subjects to significant content materials with no teacher expectancy forced upon the children. The children were allowed to utilize language and develop a general reading readiness attitude.

All subjects were post-tested with the Allyn and Bacon Pre-reading test, form II; the Metropolitan; the Wepman Auditory, form II; the Social Adjustment Scale; and the Murphy-Durrell Readiness test.

The results of this well-designed experiment showed no significant differences on the pre-tests between groups, but on the post-tests several things were learned. The informal group was superior to the basal reader group on reading readiness scores; more cooperation was shown with the informal conceptual language class, as well as their being more independent and having greater verbal output when attacking a new problem; there was no significant difference between groups in auditory and discrimination abilities and letter knowledge, despite daily training in the basal reader class; the conceptual language informal group had higher scores on visual discrimination of word forms; the older children achieved more "readiness" in both groups than the younger subjects; and finally, there was no deleterious socio-emotional effects observed in either group.

Gorelick (1965) investigated an aspect of learning opportunity which she felt was significantly related to word recognition. In her study one group received visual discrimination training for abstract symbols such as "cat" equals . The other group received training on the discrimination of meaningful symbols related to word recognition such as "cat" and a picture of a cat. First grade pupils were used for the study. After the training and experimental program, Gorelick assessed the pupils and found no significant difference between the groups.

A doctoral dissertation also investigated the effects of visual

discrimination training, this time on disadvantaged children. Pupils using the "Word Form Configuration" program, developed by the author (Streissguth, 1970), showed significant gain scores between pre- and post-test, but no significant difference between the experimental and control groups was detected.

Another study in visual discrimination training compared the effects of word and letter stimuli on learning to read a word list (Muehl, 1961). The experimenter assumed that a kindergarten level child learns to discriminate among words on the basis of the shape or form of the whole word. The assumption was similar to that of the Gorelick study cited above. In contrast, however, Muehl assumed that a child discriminates among words by attending to some part of the word such as a particular letter, part of a letter or a letter grouping. Muehl felt the study was essential since "although words are the basic meaning units in our language, it does not follow that they are also the basic units of recognition". This concept is in contrast to that expressed by Gray (1956) in a UNESCO publication: the whole word method of teaching reading assumes "individual words are the basic units of thought and recognition... that each word has a characteristic form by which it can be remembered."

In his experiment, Muehl used three groups of kindergarten children. One group of subjects was pretrained using "relevant shapes" (pronounceable pseudo-word stems) and "relevant letters" such as "feu". The second group was given an irrelevant shape with relevant letters such as "fjd", and the final group was pretrained in letter discrimination such as identification of "f".

In the program the subjects in each group were exposed to a stimulus for

two seconds and then the stimulus was removed. Next each subject was presented a response window in which he was asked to match a stimulus to the one just presented. No rewards were given for appropriate behavior.

The experimenter hypothesized that if word shape is the relevant aspect for discrimination among words, then the first experimental group should have been trained to learn faster than the second group. Additionally, if relevant letters alone provide the necessary discrimination, the first two groups should have equal transfer of discrimination pretraining.

Analysis of the data of the sixty subjects showed no significant differences between the first two groups, but the third letter discrimination group had greater letter discrimination ability although no greater word discrimination ability.

Muehl concluded that although letters included in the words are more difficult to discriminate than the same letters presented singly, the relative difficulty in learning to discriminate letters in words can be overcome by providing visual discrimination training with the relevant letters prior to presenting them as parts of words.

It appears that to reach such a conclusion Muehl should have done further experimentation with his first two groups which received training in letter shape as well as relevant letters. Additionally, his sample size of twenty subjects per group is too small to draw any solid implications from.

A doctoral dissertation on visual discrimination in relation to beginning reading compared four treatment groups (Rouch, 1968). One group of subjects was trained using matching word forms; a second group was trained with matching geometric forms; the third group received letter discrimination training; and the final group was trained to distinguish between figure and background.

Some of the pupils in the study had previous reading training using basal readers and others had been trained with the ITA method. In all instances Rouch found no significant differences between groups on their criterion task of beginning reading.

Jones, Dayton, Dizon and Leton (1966) administered oculomotor tasks and tested the vision of first graders suspected to be potentially poor readers. They discovered there was no significant difference in the motor task performance and vision between these students and a "normal" group of first graders. It would follow from this that normal and slow readers must be identified and trained in other than motor and vision tasks.

Faustman (1966) randomly assigned 28 kindergarten subjects to control or experimental treatments in perception training for an entire academic year. The two teachers were considered "equivalent" and were not told which treatment was experimental and which was control. Pupils were pre- and post-tested with the Perception Ability Form Test and also post-tested with the Gates Primary Word Recognition test. The results of the study showed the greatest gain scores appearing in the experimental group but there were no statistically significant differences in either the gain scores or between the two groups' post-test scores.

King and Muehl's study (1965) compared the effectiveness of different sensory cues and combination of cues for kindergarten children as they learned to associate printed and spoken words of varying similarity. There were ten groups of subjects, five using a list of four similar words (doll, ball, bowl, bell) and five using four dissimilar words (gate, drum, next, fork). There were five training treatments applied -- picture presentation, auditory presentation, picture and auditory, auditory and echoic response, and picture plus auditory plus echoic response. The 210 subjects 21 per condition cell, were pre-tested for IQ and no significant differences between groups were found.

An analysis of variance was performed on the data using three variables -- training methods (5), word lists (2), and number of training trials. Significant differences were detected in the kinds of words, trials effect, trials by kinds of words, and training method by kinds of words.

The experimenters concluded that the most appropriate method for teaching words varies with the similarity of the groups of words. With similar words, a printed word with appropriate picture and saying the word was fastest, rather than auditory alone. Therefore they felt that cues elicit distinctive verbal or kinesthetic responses which make similar words more distinctive. With dissimilar words, combinations made little difference in learning rate; hearing was found to be most effective.

Kind and Muehl's study is well designed and controlled. This is due to their use of random pupil assignment to experimental and control groups, and

the use of pre- and post-testing. Their conclusion that the degree to which groups of words have similar shapes and sounds is a critical factor in selection of teacher presentation method adds some support to the Radler-Kephart theory that children recognize words by their overall shapes.

A large-scale study was conducted to assess the effects of the Frostig program with the use of supplemental materials on reading scores of first graders (Rosen, 1968). Some 637 pupils from twenty-five classrooms were assigned randomly to control or experimental treatments, according to classroom. In the fall, twelve classes were selected as experimental and thirteen classrooms selected as control.

Pupils were pre-tested with the Metropolitan Readiness test, the Frostig Developmental Test of Visual Perception and the New Development Reading Test (NDRT), lower primary level 1. Before the program began, the teachers all attended a special workshop that stressed the control factors and offered special help to any teachers so requesting.

The experiment lasted for 29 days with the 305 experimental group pupils receiving thirty minutes per day of reading and perceptual training from a 100 page workbook and supplemental materials. Fifteen minutes per day of this time was over and above regular reading instruction. The article notes that 98% of the pupils did 90 to 100 pages of the workbook. The control group received the regular fifteen minute reading instruction plus an additional fifteen minutes of regular reading instruction, for a daily total of 30 minutes of reading instruction.

Pupils were post-tested with the Metropolitan, the FDTVP and the NDRT. In addition the Lorge-Thorndike was administered to compare IQ's of the two groups; no significant results were found on intelligence differences.

The analysis of the FDTVP, administered after the study, revealed that the experimental group had superior scores on perceptual ability over the control group. On the other hand, the NDRT, which was administered at the end of the school year, indicated no superiority by the experimental group. In fact the control group scored significantly higher on 2 of the 3 subtests of "word recognition", a word representing a picture; "comprehension of significant ideas", a power test of ability to comprehend ideas in a short paragraph, main ideas, opinions, conclusions, etc.; and "comprehending specific instructions", power test of ability to follow specific printed instructions. Rosen concluded that the higher scores by the control group on the criterion test for reading indicate that the additional time spent in regular reading instruction was more important than the time spent with the Frostig materials training for visual perceptual skills. Such training only yielded superior perception test scores; there was no transfer to reading gains.

A traditional readiness program based on maturation was compared with a commercial readiness kit in a dissertation by Charlotte Barnes (1971). The Harper-Row Learning Readiness System, which is based on Piaget's theory of equilibration, was used for sixteen weeks as the experimental treatment for 208 subjects. The control group used a traditional readiness program. Subjects were pre-tested with the Learning Readiness System Seriation test, the Peabody Picture Vocabulary test, and the Draw-A-Man test in which subjects were rated as high or low achievers.

After sixteen weeks of training, subjects were post-tested with the Peabody, the Metropolitan Readiness test, the Draw-A-Man and the Cooperative Primary Reading test. The results showed the experimental group scored

significantly higher on the Metropolitan, the Cooperative and the Peabody. There was no significant difference in listening vocabulary for first graders in the study.

The experimenter questioned whether her results may be only short term gains which will fade out in time. Such caution by the experimenter is rare in the studies reviewed herein. Other studies of shorter time duration with fewer controls of variance made much more sweeping conclusions than Barnes was willing to. Apparently no follow-up study was published since the 1968 study, testing whether or not the results were short or long term.

A doctoral dissertation was done investigating whether it is feasible to administer a reading readiness program in kindergarten as well as in first grade (Breon, 1967). The hypothesis questioned whether teaching the Ginn book Fun with Tom and Betty could be equally successful in a kindergarten setting as in first grade.

The experimental group consisted of 63 kindergarten children; the other group had 130 first grade children. The two groups were matched for IQ using the California test of Mental Maturity, socio-economic status, and the teachers' judgment of ability. To test for summer retention of materials the experimental group was administered the Metropolitan Readiness Test at the end of kindergarten in the spring and an alternate form was administered in the fall when the children entered first grade. As the older group finished first grade, they were tested with the California Readiness Achievement test and the Wide Range Reading Achievement test. These two tests were also administered to the experimental group one year later as they too finished first grade.

Both groups were taught reading using the Ginn book mentioned above, the difference being the grade difference, hence age and curriculum differences.

Breon found that the readiness skills obtained in the experimental (kindergarten) group were retained over the summer to the beginning of first grade, as measured by the Metropolitan. He also found that kindergarten boys did as well on all the tests as first grade boys and the same was true for the girls. From this, Breon concluded that a reading readiness program can be successfully completed in kindergarten as well as in first grade.

A similar experiment was conducted by Rosenthal (1969) in which kindergarten children of disparate entrance ages were tested to see what effect the entrance age had upon reading readiness achievement. Rosenthal concluded that early exposure to formal school training (the younger children in the test group) was desirable for a child. In addition he noted that reading readiness tests should be reevaluated and revised.

A study by Harrison and Grise (1971) into the application of a fully multi-mediated program of reading readiness for kindergarteners showed no significant results between experimental and control groups. Matched groups of 24 pupils each were used as intact kindergarten classes with one teacher and class serving as the experimental group and the other teacher and class serving as the control group.

Both classes were exposed to the "experience-centered" activity approach to learning, however the experimental group was also given a series of commercial reading readiness materials including the Imperial Co.'s "Alphabet Song", various poems and jingles, guessing and lotto games, "Alphabanks" by Ginn, Ginn tactile and kinesthetic letters, puppets, Language Master individual activities and group activities with the Bell and Howell Alphabet Master program.

Among the process skills the experimenters hypothesized the pupils would learn were: identification of a word, identification of a letter,

identification of first and last sounds of letters in a series, perception of relationship between sound and written letter and relation of oral and written words to objects, activities and ideas.

At the conclusion of the three month experimental program fifteen children of the experimental group had read one pre-primer book, and five others had read as many as four pre-primer books. Some children in the control class were also reading pre-primers at this point.

Analysis of post-test Metropolitan Reading Readiness scores for the two groups showed no significant difference using a t-test, however the experimental group scored significantly higher when data was analyzed using ANCOVA with pupil age as a covariate. Covariance was used since it was noted that the control class was on the average three months older than the experimental pupils.

There is a need to replicate the experiment presented under more controlled experimental conditions. The factor of the teacher variable was evident throughout the program, with the experimental teacher being extremely enthusiastic about the study, keeping the motivation for the children high and even encouraging the experimental pupils' parents to read to the children at home, help them identify letters, street signs and so on. There is no doubt that a Hawthorne effect was present here. Further studies should also be made using a larger sample size.

Although the above experiment clearly showed bias on the part of the teacher, this fact must be considered in the overview of pre-reading readiness training. Perhaps it is wise to allow the teacher to be extremely encouraging, very gently pushing the kindergarten child and his parents. Quite possibly the success attitude displayed by the teacher has positive effects on the

students' increased desire and hence ability to begin to read. It might be wise to develop an experiment in which the experimental group teachers could show extreme enthusiasm throughout the general program and the control teachers could show moderate kindergarten teacher enthusiasm. This may well be a highly significant aspect of the learning to read process which is yet untested.

An experiment was conducted by Sonya Friedman (1967) in which pupils were assigned to one of several perceptual training groups. One group received a regular curriculum and served as a control. One experimental group received training in a structured auditory program; another experimental group received training in a structured visual-motor program, and a third experimental group received a program which consisted of both structured auditory and visual-motor coordination training.

Friedman's results on a reading readiness test showed no differences between the auditory training program and the control group. Significant differences were found between the visual-motor group and the control, between the auditory group and the combination auditory/visual-motor group, and between the visual-motor group and the auditory/visual-motor group. From these results she concluded that an integrated auditory plus visual-motor training program significantly increased reading test scores more than any one method alone, and this type of training program can be practically implemented in a regular classroom.

Still another dissertation on the improvement of reading readiness ability by visual discrimination training in primary children was conducted by Paradis (1970). In his study using 590 preschoolers and kindergarteners two strategies were followed. The first examined the role of visual discrimination training exercises in learning the representations of objects, letters and words and

the second strategy examined the appropriateness of visual discrimination training using lessons from various packaged reading programs.

In strategy one all children were pre-tested on their visual discrimination ability and those who scored below 85% were given the treatment programs. Some 94 failing children were randomly assigned to one of four groups for three weeks -- one group served as a control and the subjects received auditory discrimination training; a second group of subjects received exercises in the representation of objects, letters and words; a third group was given training in the representation of letters and word, and the fourth group was trained in the representation of words only.

Results of the program showed that kindergarten children could reach the 85% criterion in strategy one but the preprimary children could not. No conclusive results were reached with regard to strategy two of the experiment.

It must be noted that although the low visual discrimination ability children were trained for three weeks, the actual on-task training time lasted for 45 minutes and thus it follows that no conclusions regarding use as a major program can be reached.

Applying the notion of individual pupil learning styles, Joyce Campbell (1970) trained 307 kindergarteners in visual discrimination, auditory discrimination, and visual-motor coordination in an effort to increase reading readiness scores.

Pupils were randomly assigned to two experimental groups and a control group for the duration of the six-week program. Control subjects participated in an unstructured kindergarten program which contained general activities planned to further develop visual discrimination, auditory discrimination and visual-motor coordination. The amount of time spent on each activity varied

with the child, depending on his interest level and the whim of the teacher.

One experimental group received a highly structured program using the kindergarten activities in Look and Listen level 1 of the Ginn Word Enrichment Program. This material gave training in visual discrimination, auditory discrimination and visual-motor coordination in sequences.

The other experimental group also used the Ginn materials mentioned above, but the program was individualized to suit the needs of each child. It was not a strict workbook approach for each child. The experimenter deemed this method "semi-structured".

All children were post-tested using the Clyde-Barrett Pre-Reading Battery. Results showed no significant differences between the groups on visual discrimination ability but found that the semi-structured group had significantly higher scores on the auditory discrimination subtest and both the highly structured and semi-structured groups were significantly better than the control group on measures of visual discrimination.

The experimenter concluded that the semi-structured program appeared to be the most effective method for most children. It should be noted that the actual reading ability of the children was not analyzed, only those supposed sub-skills to reading found in the Clyde-Barrett test were assessed, so that no conclusion as to what type of program enhances reading ability can be justifiably made.

June Irving (1967) conducted a study with a wide range of socio-economic status children and their use of multi-sensory materials to facilitate reading readiness. One hundred children of kindergarten level were exposed to a program of large colored pictures, selected vocabulary stories, and objects that represented speech sounds. Tape recordings and visual materials were used as well. Pupils retold the stories they heard and developed their own

original stories.

All children were pre- and post-tested with the Lee-Clark Reading Readiness test and were pre-tested with the Kuhlmann-Anderson IQ test.

Data analysis led Irving to the conclusions that multi-sensory materials provided little extra enrichment for children with average SES and IQ. Low SES children benefited most from intensively structured activities in oral language, and children of both low SES and low IQ had average gains when their IQ scores were used as a covariate. The experimenter recommended that lower SES children be given multi-sensory training, but added that such training may not aid the average child.

Such a result follows the concepts of early learning noted in work by Roche (1962). In a study conducted on reading readiness, Roche concluded that children may score adequately on a readiness test such as the Pinter-Cunningham, but if the child does poorly on functional visual and/or functional auditory acuity subtests he is doomed to fail. The training recommended by Irving might well boost the low SES or low IQ children's visual and auditory abilities, allowing him to proceed at a normal pace in learning to read.

Several recent studies have been conducted specifically with culturally deprived children in relation to using perceptual-motor training to facilitate reading readiness. Berry (1972) conducted a twelve-week training program for kindergarten-age deprived children. One group received auditory-perceptual training; a second group received visual-perceptual training; the third group was given auditory-visual integrated training, and a fourth control group was also maintained.

In his results Berry discussed the efficacy of perceptual training as a remedial measure for reading-impaired children. He felt the results from his

experiment do not lend support to the idea that perceptual training in any of the modalities investigated can serve as an effective compensatory technique for the prevention of reading disorders in culturally deprived children. He felt this was consistent with recent research which suggests that language and language-related experiences represent the most effective compensatory measures available to date for a culturally deprived child.

Such a conclusion runs somewhat contrary to Jensen and King's concluding hypothesis that each child can be helped using perceptual-motor training as long as his individual learning mode needs are enhanced. Further research is needed to clear up the inconsistencies presented by these two studies.

The problem of multiple sensory methods of learning was attacked directly by Tannenbaum (1966). His study matched 24 pairs of culturally deprived primary pupils, placing one of each pair in a control group and the other in an experimental group. The experimental group received training three times a week for forty minutes each in the areas of visual discrimination, auditory discrimination, language development, cognitive learning and the development of body image senses.

After the training both groups were post-tested on a reading readiness instrument but no significant differences between groups were detected. Such a result, if confirmed by more research could clearly challenge the concept of individual needs training since all experimental pupils were trained in all modes and still displayed no marked improvement.

Similar to the Tannenbaum study was a program conducted by Valdes (1971) in which disadvantaged pupils were trained in visual and auditory discrimination skills and then tested for reading readiness ability. Using the Metropolitan and the Lee-Clark instruments, no significant differences between the

trained and a control group were detected. She did note, however, there was a trend of improved IQ scores for the experimental group.

A study by Goolsby (1968) trained culturally deprived Head Start elementary subjects in the area of listening. The results of the study showed no significant differences, but Goolsby notes there was a trend of improvement on reading readiness scores.

Another study with disadvantaged primary children was conducted as part of a dissertation by Beidler (1969). The Peabody Language Development Kit PLDK) was used to attempt to improve pupils' intelligence, reading, listening, and writing.

Fourteen teachers in grades K-2 were assigned by the supervisor as control or experimental treatment trainers, with the teachers subjectively matched as well as possible. The control teachers administered a conventional language arts program which did not include structured daily oral language lessons. Pupils were randomly assigned to teachers in the appropriate grade levels and received the experimental or control condition for a seven month period.

Post-tests found that the control group in kindergarten did significantly better than the experimental classes on all measures. This was attributed to inequivalent groupings. At the first and second grade levels there were no significant differences. Beidler concluded that seven months training with the PLDK would not improve pupils on the stated measures, regardless of age level or sex.

The specific training in phonic analysis might well be advocated by several of the previous authors since it deals with on-task reading behaviors. Rosner (1971) conducted a program to determine whether phonic analysis training related to beginning reading skill.

Used to test the first grade pupils was the Auditory Analysis test (AAT). In the test a child responds to such items as "Say man --- now say it without the m sound"; "say belt --- now say it without the t sound"; "say stream --- now say it without the r sound". Early studies of the AAT found a correlation of between .53 and .84 between it and reading scores.

In this study 40 first graders were used. One subgroup of 16 pupils had received no kindergarten reading training, having been deemed unready by their kindergarten teachers, their reading readiness subtests, and responses to a battery of perceptual skills test. This group was called non-reader (NR) for the 1971 study. The other 24 first graders had received kindergarten pre-reading training and was called the reading group (R) for the study. The NR group was further stratified into three IQ levels and also divided into experimental and control treatments.

For 37 sessions of twenty minutes each, the experimental pupils received auditory-perceptual training such as clapping, drawing dashes, stating and omitting phonemes and phoneme substitution. This training was given to each child until he could restate a meaningful word without its initial phoneme (e.g., "fat = at"). The training continued for two sessions a week for six weeks until all experimental pupils had achieved the following objective: Given a stated one-syllable word that commences with a 2-consonant blend and continues to have meaning without the initial consonant, restate the word without the initial consonant sound (e.g., "star"). After 70 school days a reading test was administered to all pupils.

At the pre-test time, the R group was significantly superior to both NR groups but at the post-test the NR experimental group was not significantly different from the R group.

Rosner concluded that learning to read:

> probably offers an effective training program for such skills as phonic analysis by providing a visual mediator for analysis of sounds. Unfortunately some children seem to lack the basic entering behaviors or aptitudes assumed, or not even recognized by the instructional program and hence encounter difficulty in getting a substantial start reading (p. 534).

The preceding chapter clearly contains the greatest number of articles that deal with the question of the relation between perceptual motor programs and reading readiness. This is because by far, the greatest number of studies conducted in reading readiness research have been the area of vision. This is probably because of the apparent relationship between eyesight and the act of reading. Most theorists agree that "reading" involves much more than the simple act of perceiving symbols on a page, but many are also convinced that anything that can be done to enhance a child's ability to look at words as symbols can only be to his benefit in becoming a better reader. Thus the wealth of such studies.

Ot those twenty-three articles cited herein which are relevant to visual perception training programs, nine articles had results supporting such programs and fourteen articles failed to show results that were conclusive. This categorized tally can be deceiving however, since all experiments were not equivalent in quality or purpose. As has been the case before, generally those articles supporting the perceptual programs contained the greatest experimental flaws -- lack of control groups, small sample size, overgeneralized conclusions and no control for Hawthorne effect. It seems that in the experimenters' eagerness to sell a new program, validity must take a back seat to dynamic results.

Some worthwhile points in this group of studies should be reflected upon. The Stanchfield study, which supported the use of auditory discrimination, visual discrimination, oral language skills, perceptual motor skills and sound-symbol correspondence skills, had the significant aspect of a teacher pre-training

program and increased teacher collegiate atmosphere which may well have contributed to the success of the students. The use of pre-service and in-service training for teachers in early childhood programs cannot be over-emphasized.

The spinoff information gained in O'Donnell's study should be kept in mind also. Pupils trained with the informal method as opposed to a basal reader showed not only higher reading readiness scores but also were more cooperative and more verbal in attacking new problems. Also, the older children in the group appeared to profit more from the readiness training than did the younger children.

Keeping in mind that the King and Muehl study had been carefully designed and carried out, one of their conclusions should be included in the overall new information this paper yields. They found that the degree to which groups of words have similar shapes and sounds should dictate the method of presentation for optimal learning speed, e.g., similar-looking words were most rapidly learned when presented with a picture of the word's object rather than just an auditory presentation of the word.

The King and Muehl study does not specifically support the theory of special sensory presentations for various children. Several other articles seemed to deny the need for individualized sensory means for presentation of beginning reading words. The Irving, Berry and Tannenbaum studies all failed to show relationships between mode of training and pupil sensory preference.

Summary of the Research Implications

After working one's way through an extensive literature review, the ultimate question posed is what have the articles said that advanced the state of the art, in this case in reading readiness and its relation to perceptual-motor skills. A simple conclusion is not possible in this case. As the literature was presented earlier in this paper, it should have become clear that there are two distinct cases at hand: perceptual-motor/sensory-motor training is essential for effective reading readiness behavioral development, and in clear opposition, such motor training is irrelevant to reading readiness. Are these two ideas on a continuum or are they distinctly dichotomous? There are some insightful articles which help one come to some conclusions.

Frostig and Maslow (1969), obvious proponents of the need for visual perception training, stated that:

> Our knowledge will not be advanced by arguing about the degree to which visual perception is related to reading. A more fruitful approach is to explore the cognitive and other abilities of an individual, and relate them to different task processes at various stages of development and performance, so that an educator can choose the optimum method to help a particular child learn a particular task.

A very recent review of studies which purport to teach reading to kindergarteners was done by Vukelich and Beattie (1972). This article reviews ten research articles found in Education Index since 1972, and came to one obvious conclusion: "No conclusions can be made. Because of omission of data from the reports, lack of information concerning types of activities and materials used in the study and failure to define such terms as reading and reading readiness... results can be interpreted to suit personal prejudices."

The reviewers biggest complaint was the need for researchers to explain

exactly what activities the control groups specifically experience. Time and again Vukelich and Beattie, as well as this author, read that the control group in an experiment received the "traditional kindergarten program". Such a declaration is by no means a statement of operational processes. A traditional kindergarten in one county school system may be very different from another program elsewhere. This vague label does not allow the reader to determine for himself exactly what variables have been controlled for in the design and what variables were passively modified in the control as well as the experimental group. This particular issue is extremely crucial for any further research in the area if progress is to be made scientifically.

A brief ERIC monograph highlighted reading readiness research (Livo, 1972). The review of literature done in the study concluded that the lack of knowledge we presently have in regard to reading readiness is due to measurement errors. Five points were specifically cited:

1) A variety of tests would indicate the individual child's strengths and weaknesses in a variety of intellectual and behavioral tasks.
2) A combination of tests would have greater predictive value for success in beginning reading than specific measures when used alone.
3) There is no single factor of outstanding significance (which has been clearly detected and validated to date).
4) Instruments presently available to measure skills and abilities are of varying degrees of adequacy.
5) Search for new measures must continue.

The author of one of the most frequently used measures, Walter MacGinitie (1969) has called for research which would lead reading specialists to express very operational levels of pupil reading behavior. For example, child X has a memory span of five letters; he can discriminate all letters except p, d, q, b; he can segment sounds in words that are up to four phonemes long, as long as the word contains no nasal consonants or semi-vowel; he can sight read common

articles and prepositions by sight. The teacher could therefore predict that child X will make good progress on learning to discriminate visually between certain syllables and will be able to read an easy story "Q" and can learn task X easily if he learns task Y.

Although not specifically stated, MacGinitie would probably advocate the development of a hierarchy of operational skills, both process and outcome, which would allow the teacher to test a child's competencies and present him with the proper materials for his needs to reach a specified reading criterion. Such hierarchies are now commercially available such as the Criterion Reading program (Hackett, 1971).

The need for the development of hierarchies of reading ability was repeated over and over in the recent literature. Olson and Rosen (1971) as previously noted, also called for the formation of such a system during the 1971 AERA convention.

Summers (1970) definition of reading was cited at the beginning of this paper. In his article on defining reading more than 500 reading educators were surveyed with five major conclusions concerning reading research in the 1960's resulting:

1) Improvement in reading instruction seemed to have reached a plateau.
2) Different methods for teaching reading did not produce significantly different results.
3) A broadly accepted model of reading, showing its constituent elements, did not exist.
4) Summaries of research on reading indicate that most of the research in the field had been done in a manner that prohibited synthesis of knowledge gained.
5) Previous attempts to concentrate emphasis on reading, undertaken on the part of the funding agencies, had produced proposals for research on part of the problem with little hope for cumulative resolution of the total problem.

Rosner (1971) conducted an extensive study in phonic analysis training and beginning reading skills which was cited earlier in this paper. There were some conclusions he reached however which are worth reexamining at this time. He stated that:

> ...learning to read probably offers an effective training program for such skills (phonic analysis) by providing a visual mediator for analysis of sounds. Unfortunately some children seem to lack the basic entering behaviors or aptitudes assumed, or not even recognized, by the instructional program and hence, encounter difficulty in getting substantial starts in reading (p. 534).

Rosner and Summers (1970) have possibly hit upon what appears to this researcher to be the key to reading readiness success. While concentrating exclusively on "academic" activities that can facilitate reading behaviors, most researchers have failed to consider more basic behaviors such as attending behaviors.

In 1971 Klesius presented a paper which examined 38 journal articles that dealt with the effect of perceptual-motor development programs on reading readiness and reading achievement. He found only eleven of "high calibre". Some of his criteria for assessing the articles included using only those with an N equal to or greater than 40 subjects, those articles with an experimental period of at least 18 weeks, and those articles which had pre-testing and post-testing as well as experimental and control groups.

He then divided the studies into classes of those which supported and those which refuted sensory-motor readiness programs as necessary for reading. He concluded that the hypothesis had not been confirmed or denied by the research at hand.

Klesius felt the importance of the research projects may be in the specification of those conditions under which the perceptual-motor programs

are appropriate, such as, it appeared that disadvantaged children should receive the training as a preventative measure and so should some with learning disabilities. Overall five studies support perceptual-motor training and six refuted it.

A review of 27 research projects in first grade reading by Bond and Dykstra was critiqued by Calfee and Venezky (1968). There were essentially three major conclusions derived from the 27 articles. These were:

1) Various innovative methods, whether phonic, linguistic, orthographical, or language experience, produced reading achievement scores at the end of the first grade that were slightly higher than basal reader methods;
2) These differences were generally small and were not consistently observed by all researchers in all school systems;
3) There was no evidence of differential effectiveness, i.e., it was not true that some methods worked better with low I.Q. students and others with high I.Q. students).

In addition Calfee and Venezky stated that reading achievement must be determined by many factors of equal or greater importance than those examined by Bond and Dykstra; that is, factors other than readiness, IQ, method/material variation, teacher experience, and community background. Calfee and Venezky further note that nc relation to reading performance was detected while measuring teacher variables of sex, age, education; certification, experience, attitude toward teaching and rated effectiveness.

In respect to those results where significant although inconsistent high scores were produced, Calfee and Venezky note that Chall's (1967) assumption of Hawthorne effect might have been responsible for the results. Chall felt that in such experiments as the 27 cited by Bond and Dykstra, the novelty of the treatment, the fresh books and supplementary materials, the special training for the teacher, and the knowledge by both students and parents that they were being treated differently, would be enough to produce the sporatic significance found.

Concerning the specific predictive ability of various standardized beginning reading tests, Calfee and Venezky concluded that "...the rating by the kindergarten teacher is the best single predictor of test performance" (p. 98). And "The trouble with reading readiness tests is that they do not provide measures of component skills that are related to reading performance in any well-defined manner" (p. 102). This statement was made after an extensive explanation of the intercorrelations between various reading readiness subtests and the correlations between the different brands of tests themselves.

Calfee and Venezky concluded that "it is hard to believe that the sum total of a child's intellectual ability can be measured by his knowledge of the letters of the alphabet prior to first grade" (p. 107). They indicate hope that the components of the reading process can be clearly identified and tested appropriately; and most importantly, that low scores on valid predictors of reading will indicate to the teacher exactly what steps need to be taken to train the pupil in overcoming the diagnosed disadvantage.

It is highly significant to note that scores of reading specialists agree that different methods of teaching reading do not produce different results, as Summers (1970) pointed out. Further it is crucial to note as Rosner (1971) has, that some children do not possess basic entering behaviors or aptitudes and thus cannot succeed in reading readiness tasks.

It would appear to this researcher that for young children of average intelligence and socio-economic status, the underlying factor for beginning reading success is not just knowing letter names, or letter sounds, or discriminating a letter from a word or a sentence, but instead the key is the ability to know what on-task reading readiness behavior is, and the ability to stay on-task for sufficient lengths of time.

Researchers and teachers of beginning reading have repeatedly expressed confusion as to what "reading readiness" is. If the teachers don't know, certainly the child will not know what he is expected to do to be able to read.

Basic activities such as knowing leftness and rightness and the activity of reading from left to right down a page are important. Also letter sounds and blends are an important part of the cadre of skills a child must come to the reading lesson with, but the most important factors are probably motivational.

Does the child desire to read? Is learning to read his choice or is it being forced upon him? Has the child proven he can concentrate moderately on a serious task for at least ten or fifteen minutes at a time? (If the reading lessons exceed the child's concentration span, no new information will be gained by the child after he has the teacher shut off; at the worst, the child will become aggravated by the additional lesson time being forced upon him and may become overtly or passively hostile to any further reading lessons. Can the child stay on task when he is in a learning group or does he become distracted by other children? Such a child either should be taught individually or the reading lessons for him should be postponed until his group behavior has been refined to a level to allow him to learn in the presence of his peers.

Allowing each child to start reading when he wants to (and he will want to); to have lesson lengths that are comfortable for him, and to proceed at his individual pace through the academic process of skills such as those pointed out in the Hackett Criterion Reading System may be the answer to reading readiness.

Reviewing the treatment categories of gross-motor training, fine-motor

training and visual perception training, one is once again faced with the same sorts of problem found by reviewers Livo, Summers, Klesius, Bond and Dykstra, and Calfee and Venezky. It appears that not enough consistency exists in the data to draw scientific conclusions about the research.

In this review, most of the articles which advocated use of gross and fine motor training programs for average ability kindergarteners were effectively negated. The information sought by researchers, namely, what can facilitate beginning reading, was not found. At least, however, some pointless ventures were terminated.

The section on visual perception and auditory perception training is impossible to condense into clear scientific knowledge. Some respectable studies found clear advantages to the training, other equally scientific articles tended to criticize the need for pre-training in visual or auditory perception on the basis that the society of the 1970's in and of itself adequately primes the pre-school child in these areas, and further training is not necessary except perhaps in the case of culturally disadvantaged children.

One very probable explanation of why reading readiness research has been and continues to be so inconclusive has been set forth by MacGinitie and others. As mentioned earlier, new procedures for defining reading behavior are needed. This entails not only the establishment of a valid sequence of skills in beginning reading, but also the development of new "reading readiness" tests. Throughout the research reviewed, the one repeating weakness was the lack of an adequate dependent variable instrument. It is with some joy that we can note today that Calfee has been given a substantial Carnegie grant to study developmental reading and to prepare new instruments

that will assess behaviors which do cause reading. Never before has a large scale program been undertaken specifically aimed at solving the beginning reading puzzle.

Evidence has been extremely scant in showing the need for perceptual-motor and sensory-motor programs as a success factor in reading readiness. If anything, such materials as Kephart advocates are doing two things at once: children are being given a physical education program and children are being trained to work together and learn new things. It is probably this second factor that has facilitated reading in those studies where such is the case, not some underlying variable of psychomotor development.

To date there has been no conclusive evidence presented in the research to state that the perceptual-motor/sensory-motor abilities required for reading (eye motor skills, for example) are alterable by anything other than time in a broad range of "normal" children. That is to say that such perception is nearly exclusively a factor of maturation. The process is not hastened by training, and the training is of no value once the maturational step has been taken. Specific perceptual motor training may be of some value in instances such as dyslexia, but is not needed for the typical child.

The only other instance where perceptual-motor training has been shown to be beneficial to reading readiness is with culturally disadvantaged youth. The programs, however, may be facilitating reading primarily because of their relationship to group activity rather than physical development.

Further research is needed in the areas of visual discrimination and perception training to clarify the relationship between maturational improvement and actual academic training in these areas. No final evidence has been brought forward that visual perception training is essential for learning to

read and that maturation and socialization alone cannot achieve the same ends.

Additionally, experimentation on the effects of social maturation and the child's motivation to read, needs to be conducted. Such experiments would allow reading theorists to discriminate more accurately between a child's physical ability to read and a child's emotional desire to read. Currently, this crucial area has little if any relevant scientific data.

And finally, research on these topics should be expanded in time and subject population size. Time and again, the articles reviewed herein consisted of an experimental treatment in which subjects actually received on-task training for only a few hours. For example, a fifteen minute session once a week for a full semester is only nine hours of training, not accounting for review time. It is not reasonable to assume such brief exposure can cause significant differences, perhaps this is one reason for the great lack of significant differences. The same is true for sample size. Rather than use only two fixed 25-pupil classrooms and two teachers, much larger numbers of teachers and students should be used to allow more generalizable inferences.

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